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LEE, JOHN W	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/565,863	TAKAISHI, YOSHITOMO	
	Examiner	Art Unit	
	JOHN Wahnkyo LEE	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 September 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) *2-5 and 11* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 6-10 and 12-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

- Claims 1, 6-10 and 12-23 are pending; claims 1, 10, 12-13 and 17 are amended; claims 2-5 and 11 are canceled; claims 18-23 are added.

Response to Amendments/Arguments

1. Applicant's amendment filed 21 September 2010 with respect to claims 1, 6-10 and 12-23 are entered and have been fully considered.

2. Objection to the Abstract is withdrawn.

3. Applicant's argument of rejection of claim 13 under 35 U.S.C. 112, second paragraph has been considered. However, the claim rejection cannot be withdrawn, and the reason will be provided below.

4. Applicant's arguments of the rejected claims 1, 6-10 and 12-17 under 35 U.S.C. § 103(a) have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 1, 6-10 and 12-23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application

was filed, had possession of the claimed invention. In the independent claims 1 and 12, the claims recite "said X-ray picture resulting from x-raying said artificial reference specimen disposed in such a position that said picture of said artificial reference specimen is positioned beside said picture of said mandible in said X-ray picture," which is not clear whether it is supported by the specification.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

a. Claim 13 have insufficient antecedent basis for the limitation in the claim.

Regarding claim 13, “said standard average” (line 2) and “said standard deviation” (lines 2-3) has a lack of antecedent basis because the claim contains no earlier recitation or limitation of “a standard average" and "a standard deviation.” It would be unclear as to what element "said standard average" and “said standard deviation” are making reference.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 1, 6-10 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choel et al. (”Trabecular alveolar bone in the human mandible: A dual energy x-ray absorptiometry study") in view of Inoue (US 2001/0021269).

a. Regarding claim 1, Choel discloses a bone mineral density evaluation system for evaluating a bone mineral density from an X-ray picture (Objective; page 364, “evaluate the potential use of dual energy x-ray absorptiometry for the assessment of bone mineral content and bone mineral density”) of a mandible (Fig. 1; Chapter-Material and Methods: Ex vivo materials, page 365, “mandibular bone”), said X-ray picture containing a picture of an artificial reference specimen (Fig. 2; Chapter-Material and Methods: Ex vivo materials, page 365, “The author discloses that three regions of interest- G, R1 and R2 were delineated from the three specimens- Incisal specimen (IS), premolar specimen (PS) and molar specimen (MS), by the x-ray.”) disposed beside a picture of said mandible (Fig. 1; Chapter-Material and Methods: Ex vivo materials, page 365, “mandibular bone”), said X-ray picture resulting from x-raying said artificial reference specimen is positioned beside said picture of said mandible in said X-ray picture (Fig. 2; "R1 was delineated ... mandibular ... " at Chapter -"Materials and Methods: Ex vivo materials", page 365), said system comprising:

detecting means for detecting a gradation particular portion of said picture of said specimen (Fig. 2; Chapter-Material and Methods: Ex vivo materials, page 365, “The author discloses that three regions of interest- G, R1 and R2 were delineated from the three specimens- Incisal specimen (IS), premolar specimen (PS) and molar specimen

(MS), by the x-ray. Moreover, x-ray pictures have gradation level- black and white.");

and

evaluating means for evaluating the bone mineral density means (Table III; Chapter- Material and Methods: Ex vivo materials and Chatper-BMD differences related to sex, dental status, and anatomic location, pages 365 and 367, "The author discloses using a multiple regression analysis based on the mean bone mineral density (BMD) and SDs for G, R1 and R2, which are the global specimen, infra-alveolar ROI and real intra-alveolar ROI, respectively, to assess the sex and dental status.") on the basis of the gradation of said X-ray picture (Fig. 2; Chapter-Material and Methods: Ex vivo materials, page 365, "The author discloses that three regions of interest- G, R1 and R2 were delineated from the three specimens- Incisal specimen (IS), premolar specimen (PS) and molar specimen (MS), by the x-ray. Moreover, x-ray pictures have gradation level- black and white.")

wherein:

said evaluating means makes evaluation (Table III; Chapter- Material and Methods: Ex vivo materials and Chatper-BMD differences related to sex, dental status, and anatomic location, pages 365 and 367, "The author discloses using a multiple regression analysis based on the mean bone mineral density (BMD) and SDs for G, R1 and R2, which are the global specimen, infra-alveolar ROI and real intra-alveolar ROI, respectively, to assess the sex and dental status.") on the basis of the gradation of a particular region (Fig. 2; Chapter-Material and Methods: Ex vivo materials, page 365, "The author discloses that three regions of interest- G, R1 and R2 were delineated from

the three specimens- Incisal specimen (IS), premolar specimen (PS) and molar specimen (MS), by the x-ray.") of said mandible (Fig. 1; Chapter-Material and Methods: Ex vivo materials, page 365, "mandibular bone") in said X-ray picture (Objective; page 364, "dual energy x-ray absorptiometry"); and

said particular region (Fig. 2; Chapter-Material and Methods: Ex vivo materials, page 365, "The author discloses three regions of interest- G, R1 and R2.") includes a region corresponding to an alveolar bone portion (Chapter- Material and Methods: Ex vivo materials, page 365, "The author discloses R1 and R2 are infra-alveolar ROI and real intra-alveolar ROI, respectively.") around a first premolar (Fig. 1; Chapter- Material and Methods: Ex vivo materials, page 365, "premolar specimen (PS)").

However, Choel does not disclose correcting means for correcting the gradation of said X-ray picture so as to make the gradation of said particular portion of said picture of said artificial reference specimen as detected by said detecting means comply with a preset standard.

Instead of Choel, Inoue, the same field of endeavor of medical digital x-ray image processing, discloses correcting means for correcting (Fig. 1; "convert an input image from which the histogram 101 is obtained to an aimed image (image in an ideal state) for which the histogram 102 is obtained" at ¶¶ 0052 and 0057) the gradation of said X-ray picture (Fig. 1-101, "histogram of input image"; "histogram of an X-ray dose (pixel value) of an image (input image) of a specific field of a subject" at ¶0047) so as to make the gradation of said particular portion of said picture of said artificial reference specimen (Fig. 1-101, "histogram of input image"; "histogram of an X-ray dose (pixel

value) of an image (input image) of a specific field of a subject" at ¶0047) as detected by said detecting means comply (Fig. 1-106, "broadly equalized histogram"; "[G]enerally equalized histogram is captuered" at ¶¶ 0050 and 0051) with a standard value (Fig. 1-102, "aimed histogram"; a histogram (aimed histogram) of an X-ray dose (pixel value) of an image in an ideal state (hereinafter referred to as "an aimed image") of a specific field (identical with a field in an input image) of a subject" at ¶ 0051).

Choel and Inoue are combinable because they are all related to the field of medical digital x-ray image processing.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to applying the steps of detecting the "histogram of an X-ray dose (pixel value) of an image (input image) of a specific field of a subject" (Inoue; Fig. 101; ¶ 0047) and "converting an input image[,] from which the histogram 101 is obtained [,] to an aimed image (image in an ideal state)[,] for which the histogram 102 is obtained" (Inoue; Fig. 1; ¶¶ 0052 and 0057), using "the generally equalized histogram [being] captured" (Inoue; Fig. 1-106; ¶ 0050 and 0051) taught by Inoue in the process of delineating the "three region (ROIs: G, R1, R2)" (Choel; Fig. 2; Chapter Material and Methods: Ex vivo materials, page 365) of Choel's method of "evaluate the potential use of dual energy x-ray absorptiometry for the assessment of bone mineral content and bone mineral density" (Choel; Objective; page 364).

The suggestion/motivation for doing so would have been to eliminate "unstableness of gradation conversion processing [of] a complicated operation such as analysis of an object image itself analysis of a histogram of an object image intervenes

of the like, [which] a lot of time is required for analysis ,computational processing or the like, and in some object images, an analysis mistake may occur" (Inoue; ¶ 0025) by providing "a [process] of changing a gradation conversion characteristics used in applying gradation conversion processing to an aimed image" (Inoue; ¶ 0046) and "utilize[ing] equalization of a histogram" (Inoue; ¶ 0046) that will "enable realization of stable gradation conversion easily and efficiently" (Inoue; ¶ 0027).

Therefore, it would have been obvious to combine Choel and Inoue to obtain the invention as recited in claim 1.

b. Regarding claim 6, the combination of Choel and Inoue, as applied in claim 1, discloses all the previous claim limitations. Moreover, Inoue discloses further comprising setting means for setting said standard value ("setting a form of an ideal histogram" at ¶ 0067).

Choel and Inoue are combinable because they are all related to the field of medical digital x-ray image processing.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply "setting a form of an ideal histogram" (Inoue; ¶ 0067) taught by Inoue in the process of delineating the "three region (ROIs: G, R1, R2)" (Choel; Fig. 2; Chapter Material and Methods: Ex vivo materials, page 365) of the combination of Choel and Inoue.

The suggestion/motivation for doing so would have been to enable "a user [] to select an aimed field … and to set parameters for image processing with respect to the aimed field" (Inoue; ¶ 0075) because "a method of image processing or its conditions is

different for each field of a human body that requires treatments or diagnosis in the [] X-ray photographing apparatus or system [] in order to perform image processing peculiar to each field" (Inoue; ¶ 0075).

Therefore, it would have been obvious to combine Choel and Inoue to obtain the invention as specified in claim 6.

c. Regarding claim 7, the combination of Choel and Inoue, as applied in claim 1, discloses wherein said standard value (Inoue; Fig. 1-102, "aimed histogram"; a histogram (aimed histogram) of an X-ray dose (pixel value) of an image in an ideal state (hereinafter referred to as "an aimed image") of a specific field (identical with a field in an input image) of a subject" at ¶ 0051) being set based on a result of detection by said detecting means of a particular X-ray picture (Inoue; "The author discloses the aimed histogram is a specific field, which is identical with a field in an input image that is captured by X-ray photographing, of a subject. The specific field of the subject, which is a human body disclosed in Inoue, is the result of detection by the detecting means of a X-ray photography" ¶ 0047 and 0051).

d. Regarding claim 8, the combination of Choel and Inoue, as applied in claim 1, discloses all the previous claim limitation including wherein said evaluating means (Choel;Table III; Chapter- Material and Methods: Ex vivo materials and Chatper-BMD differences related to sex, dental status, and anatomic location, pages 365 and 367, "The author discloses using a multiple regression analysis based on the mean bone mineral density (BMD) and SDs for G, R1 and R2, which are the global specimen, infra-alveolar ROI and real intra-alveolar ROI, respectively, to assess the sex and dental

status."). Moreover, Inoue discloses display means (Fig. 3-310; "display" at ¶ 0118) for displaying said corrected gradation in the form of histogram (Fig. 3-307; "The author discloses that a histogram, which is created after gradation conversion has passed through the memory, is displayed on the display as the histogram" at ¶ 0118).

Choel and Inoue are combinable because they are all related to the field of medical digital x-ray image processing.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the step of "[t]he created histogram [being] displayed on the display 310 as the histogram 307" (Inoue; Figs. 3-307 and 3-310; ¶ 0118) in the step of the "multiple regression analysis … [which] sex and dental status [being] assessed' (Chole; Table III; Chapter- Material and Methods: Ex vivo materials and Chatper-BMD differences related to sex, dental status, and anatomic location, pages 365 and 367) of the combination of Chole and Inoue.

The suggestion/motivation for doing so would have been to provide "[t]he created histogram [being] displayed on the display at the histogram" (Inoue; ¶ 0118) because "an observer can observe most easily" (Inoue; ¶ 0067) "a histogram of an image ... while gradationally converting one or a plurality of images interactively" (Inoue; ¶ 0067).

Therefore, it would have been obvious to combine Choel and Inoue to obtain the invention as specified in claim 8.

e. Regarding claim 9, the combination of Choel and Inoue, as applied in claim 1, discloses wherein said evaluating means includes judging means for judging said bone mineral density (Choel; Fig. 2; Table III; Chapter-BMD differences related to

sex, dental status, and anatomic location, page 367, "The author discloses using a multiple regression analysis based on the mean bone mineral density (BMD) and SDs for G, R1 and R2 to assess the sex and dental status.") on the basis of said corrected gradation (Inoue; Fig. 1; "convert an input image from which the histogram 101 is obtained to an aimed image (image in an ideal state) for which the histogram 102 is obtained" at ¶¶ 0052 and 0057).

f. Regarding claim 10, the combination of Choel and Inoue, as applied in claim 1, discloses further comprising output means for providing together a plurality of evaluation results provided by said evaluating means (Choel; Fig. 2; Table III; Chapter-BMD differences related to sex, dental status, and anatomic location, page 367, "The author discloses using a multiple regression analysis based on the mean bone mineral density (BMD) and SDs for G, R1 and R2 to assess the sex and dental status.") for respective ones of a plurality of X-ray pictures (Choel; Fig. 2; Table III; Chapter-BMD differences related to sex, dental status, and anatomic location, page 367, "G, R1 and R2 obtained for male and female specimens, and dentate and edentulous specimens").

g. Regarding claim 21, the combination of Choel and Inouse does not disclose expressly that said artificial reference specimen is an aluminum block. Instead, Chole indicates that said artificial reference specimen is from Ex vivo materials (page 365).

At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to use Chole's Ex vivo materials because Applicant has not disclosed that the artificial reference specimen being an

aluminum block provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Choel's Ex vivo materials, and applicant's invention, to perform equally well with either using the claim specified in claim 21 or Choel's Ex vivo materials.

Therefore, it would have been obvious to modify Choel's to obtain the invention as specified in claim 21 because such a modification would have been considered a mere design consideration which fails to patentably distinguish over the prior art of Choel.

h. Regarding claim 22, the combination of Choel and Inouse does not disclose expressly that said artificial reference specimen is an aluminum block being a stepped structure. Instead, Chole indicates that said artificial reference specimen is from Ex vivo materials (page 365).

At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to use Chole's Ex vivo materials because Applicant has not disclosed that the artificial reference specimen being an aluminum block having a stepped structure provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Choel's Ex vivo materials, and applicant's invention, to perform equally well with either using the claim specified in claim 22 or Choel's Ex vivo materials.

Therefore, it would have been obvious to modify Choel's to obtain the invention as specified in claim 22 because such a modification would have been considered a

mere design consideration which fails to patentably distinguish over the prior art of Choel.

i. Regarding claim 23, claim 23 is analogous and corresponds to claim 22. See rejection of claim 22 for further explanation.

11. Claims 12-14 and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choel et al. (”Trabecular alveolar bone in the human mandible: A dual energy x-ray absorptiometry study") in view of Kim (US 6,078,686).

a. Regarding claim 12, Choel discloses a bone mineral density evaluation system for evaluating a bone mineral density from an X-ray picture (Objective; page 364, “evaluate the potential use of dual energy x-ray absorptiometry for the assessment of bone mineral content and bone mineral density”) of a mandible (Fig. 1; Chapter-Material and Methods: Ex vivo materials, page 365, “mandibular bone”), said X-ray picture containing a picture of an artificial reference specimen (Fig. 2; Chapter-Material and Methods: Ex vivo materials, page 365, “The author discloses that three regions of interest- G, R1 and R2 were delineated from the three specimens- Incisal specimen (IS), premolar specimen (PS) and molar specimen (MS), by the x-ray.”) disposed beside said mandible (Fig. 1; Chapter-Material and Methods: Ex vivo materials, page 365, “mandibular bone”), said X-ray picture resulting from x-raying said artificial reference specimen is positioned beside said picture of said mandible in said X-ray picture (Fig. 2; "R1 was delineated ... mandibular ... " at Chapter -"Materials and Methods: Ex vivo materials", page 365), a gradation of said picture of said specimen varying from portion

to portion (Fig. 2; Chapter-Material and Methods: Ex vivo materials, page 365, "The author discloses that three regions of interest- G, R1 and R2 were delineated from the three specimens- Incisal specimen (IS), premolar specimen (PS) and molar specimen (MS), by the x-ray. Moreover, x-ray pictures have gradation level- black and white."), said system comprising:

detecting means for detecting the gradation of said picture of said artificial reference specimen (Fig. 2; Chapter-Material and Methods: Ex vivo materials, page 365, "The author discloses that three regions of interest- G, R1 and R2 were delineated from the three specimens- Incisal specimen (IS), premolar specimen (PS) and molar specimen (MS), by the x-ray. Moreover, x-ray pictures have gradation level- black and white."); and

evaluating means for evaluating the bone mineral density (Table III; Chapter-Material and Methods: Ex vivo materials and Chatper-BMD differences related to sex, dental status, and anatomic location, pages 365 and 367, "The author discloses using a multiple regression analysis based on the mean bone mineral density (BMD) and SDs for G, R1 and R2, which are the global specimen, infra-alveolar ROI and real intra-alveolar ROI, respectively, to assess the sex and dental status.") on the basis of the gradation of said X-ray picture (Fig. 2; Chapter-Material and Methods: Ex vivo materials, page 365, "The author discloses that three regions of interest- G, R1 and R2 were delineated from the three specimens- Incisal specimen (IS), premolar specimen (PS) and molar specimen (MS), by the x-ray. Moreover, x-ray pictures have gradation level-black and white."),

wherein said evaluating means makes evaluation (Table III; Chapter- Material and Methods: Ex vivo materials and Chatper-BMD differences related to sex, dental status, and anatomic location, pages 365 and 367, "The author discloses using a multiple regression analysis based on the mean bone mineral density (BMD) and SDs for G, R1 and R2, which are the global specimen, infra-alveolar ROI and real intra-alveolar ROI, respectively, to assess the sex and dental status.") on the basis of the gradation of a particular region of said mandible in said X-ray picture (Fig. 2; Chapter-Material and Methods: Ex vivo materials, page 365, "The author discloses that three regions of interest- G, R1 and R2 were delineated from the three specimens- Incisal specimen (IS), premolar specimen (PS) and molar specimen (MS), by the x-ray. Moreover, x-ray pictures have gradation level- black and white."),

wherein said particular region (Fig. 2; Chapter-Material and Methods: Ex vivo materials, page 365, "The author discloses three regions of interest- G, R1 and R2.") includes a region corresponding to an alveolar bone portion (Chapter- Material and Methods: Ex vivo materials, page 365, "The author discloses R1 and R2 are infra-alveolar ROI and real intra-alveolar ROI, respectively.") around a first premolar (Fig. 1; Chapter- Material and Methods: Ex vivo materials, page 365, "premolar specimen (PS)").

However, Choel does not disclose detecting means for detecting an average and a deviation of the gradation of said picture and correcting means for correcting the gradation of said X-ray picture so as to make the average and the deviation as detected

by said detecting means comply with a preset standard average and a preset standard deviation.

Instead of Choel, Kim, the same field of endeavor of image processing, discloses detecting means for detecting an average (FIG. 4-304, "frame mean calculator; "A frame mean calculator calculates the mean level (X_m)" at col. 8, lines 38-39) and a deviation (FIGs. 4-308, "a first CDF calculator" and 4-310, "a second CDF calculator"; equations (15) and (16); "calculate[ing] a cumulative density function (CDF) $c_L(X_k)$... calculate[ing] a cumulative density function (CDF) $c_U(X_k)$" at col. 8, lines 63-67 to col. 9, lines 1-18) of the gradation of said picture ("[A]n input image signal {Y} [being] comprised of L discrete level represented by $\{\{X_0, X_1, ..., X_{L-1}\}$" at col. 8, lines 36-37) and

correcting means for correcting the gradation (equation (18); "equalized output (Yo)" at col. 10, lines 22-25 and 37-38) of said picture ("[A]n input image signal {Y} [being] comprised of L discrete level represented by $\{\{X_0, X_1, ..., X_{L-1}\}$" at col. 8, lines 36-37) so as to make the average (FIG. 4-304, "frame mean calculator; "A frame mean calculator calculates the mean level (X_m)" at col. 8, lines 38-39) and the deviation (FIGs. 4-308, "a first CDF calculator" and 4-310, "a second CDF calculator"; equations (15) and (16); "calculate[ing] a cumulative density function (CDF) $c_L(X_k)$... calculate[ing] a cumulative density function (CDF) $c_U(X_k)$" at col. 8, lines 63-67 to col. 9, lines 1-18) as detected by said detecting means comply with a preset standard average (equation (17); "a compensated mean level (B_m) $B_m = X_m + \Delta$" at col. 9, lines

34-35) and a preset standard deviation (equations (18) and (19); "$c_L(X_k)B_m$" and "$B'_m+(X_{L-1}-B'_m)c_U(X_k)$" at col. 10, lines 21-25).

Choel and Kim are combinable because they are all related to the field of image processing.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the "contrast enhancer" (KIM; FIG. 1-300; col. 8, lines 29-30) comprising "the frame mean calculator" (Kim; FIG. 4-304; col. 8, lines 38-39), "the first and second CDF calculator (Kim; equations (15) and (16); FIGS. 4-308 and 4-310; col. 8, lines 63-67 to col. 9, lines 1-18), "brightness compensator" (Kim; FIG. 4-314; col. 9, lines 29-67) and "the first and second mapper" (Kim; FIGS. 4-316 and 318; col. 10, lines 5-36) taught by Kim in in the process of delineating the "three region (ROIs: G, R1, R2)" (Choel; Fig. 2; Chapter Material and Methods: Ex vivo materials, page 365) of Choel's method of "evaluate the potential use of dual energy x-ray absorptiometry for the assessment of bone mineral content and bone mineral density" (Choel; Objective; page 364).

The suggestion/motivation for doing so would have been to provide "a contrast enhancer based on mean-separate histogram equalization having … brightness compensation" (Kim; col. 4, lines 36-41) for "image quality enhancing" (Kim; col. 4, line 37), and especially, when the "mean-separated histogram equalization is applied, an abrupt change in brightness and artifacts, which can be generated after a general histogram equalization when an input image has a concentrated distributed histogram, can be effectively prevented" (Kim; col. 4, lines 46-51).

Therefore, it would have been obvious to combine Choel and Kim to obtain the invention as recited in claim 12.

b. Regarding claim 13, the combination of Choel and Kim, as applied in claim 12, discloses all the previous claim limitations. Moreover, Kim discloses further comprising setting means for setting said standard average and said standard deviation (FIGS. 5a and 5b; “[t]he corrected values (Δ) [being] determined by correction function" at col. 9, lines 43-47).

Choel and Kim are combinable because they are all related to the field of image processing.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply “[t]he corrected values (Δ) [being] determined by correction function" (Kim; FIGS. 5a and 5b; col. 9, lines 43-47) taught by Kim in the process of delineating the “three region (ROIs: G, R1, R2)” (Choel; Fig. 2; Chapter Material and Methods: Ex vivo materials, page 365) of the combination of Choel and Kim.

The suggestion/motivation for doing so would have been to provide “[a] brightness compensation [that] can be simply carried out by mapping a current mean to a desired out mean during the mean-separated histogram equalization” (Kim; col. 4, lines 57-59) when it is applied, "an abrupt change in brightness and artifacts, which can be generated after a general histogram equalization when an input image has a concentrated distributed histogram, can be effectively prevented” (Kim; col. 4, lines 46-51).

Therefore, it would have been obvious to combine Choel and Kim to obtain the invention as specified in claim 13.

c. Regarding claim 14, the combination of Choel and Kim, as applied in claim 12, discloses wherein said standard average (Kim; equation (17); "a compensated mean level (B_m) $B_m = X_m + \Delta$" at col. 9, lines 34-35) and said standard deviation (Kim; equations (18) and (19); "$c_L(X_k)B_m$" and "$B'_m+(X_{L-1}-B'_m)c_U(X_k)$" at col. 10, lines 21-25) being set based on a result of detection by said detecting means (Kim; FIG. 4-304, "frame mean calculator; "A frame mean calculator calculates the mean level (X_m)" at col. 8, lines 38-39; FIGs. 4-308, "a first CDF calculator" and 4-310, "a second CDF calculator"; equations (15) and (16); "calculate[ing] a cumulative density function (CDF) $c_L(X_k)$... calculate[ing] a cumulative density function (CDF) $c_U(X_k)$" at col. 8, lines 63-67 to col. 9, lines 1-18) of a particular X-ray picture (Choel; Fig. 2; Chapter-Material and Methods: Ex vivo materials, page 365, "The author discloses that three regions of interest- G, R1 and R2 were delineated from the three specimens- Incisal specimen (IS), premolar specimen (PS) and molar specimen (MS), by the x-ray.").

d. Regarding claim 16, the combination of Choel and Kim, as applied in claim 12, discloses wherein said evaluating means including judging means for judging said bone mineral density (Choel; Fig. 2; Table III; Chapter-BMD differences related to sex, dental status, and anatomic location, page 367, "The author discloses using a multiple regression analysis based on the mean bone mineral density (BMD) and SDs for G, R1 and R2 to assess the sex and dental status.") on the basis of said corrected gradation (Kim; equation (18); "equalized output (Yo)" at col. 10, lines 22-25 and 37-38).

e. Regarding claim 17, the combination of Choel and Kim, as applied in claim 12, discloses further comprising output means for providing together a plurality of evaluation results provided by said evaluating means (Choel; Fig. 2; Table III; Chapter-BMD differences related to sex, dental status, and anatomic location, page 367, "The author discloses using a multiple regression analysis based on the mean bone mineral density (BMD) and SDs for G, R1 and R2 to assess the sex and dental status.") for respective ones of a plurality of X-ray pictures (Choel; Fig. 2; Table III; Chapter-BMD differences related to sex, dental status, and anatomic location, page 367, "G, R1 and R2 obtained for male and female specimens, and dentate and edentulous specimens").

f. Regarding claim 18, the combination of Choel and Kim does not disclose expressly that said artificial reference specimen is an aluminum block. Instead, Chole indicates that said artificial reference specimen is from Ex vivo materials (page 365).

At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to use Chole's Ex vivo materials because Applicant has not disclosed that the artificial reference specimen being an aluminum block provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Choel's Ex vivo materials, and applicant's invention, to perform equally well with either using the claim specified in claim 18 or Choel's Ex vivo materials.

Therefore, it would have been obvious to modify Choel's to obtain the invention as specified in claim 18 because such a modification would have been considered a

mere design consideration which fails to patentably distinguish over the prior art of Choel.

g. Regarding claim 19, the combination of Choel and Kim does not disclose expressly that said artificial reference specimen is an aluminum block being a stepped structure. Instead, Chole indicates that said artificial reference specimen is from Ex vivo materials (page 365).

At the time the invention was made, it would have been an obvious matter of design choice to a person of ordinary skill in the art to use Chole's Ex vivo materials because Applicant has not disclosed that the artificial reference specimen being an aluminum block having a stepped structure provides an advantage, is used for a particular purpose, or solves a stated problem. One of ordinary skill in the art, furthermore, would have expected Choel's Ex vivo materials, and applicant's invention, to perform equally well with either using the claim specified in claim 19 or Choel's Ex vivo materials.

Therefore, it would have been obvious to modify Choel's to obtain the invention as specified in claim 19 because such a modification would have been considered a mere design consideration which fails to patentably distinguish over the prior art of Choel.

h. Regarding claim 20, claim 20 is analogous and corresponds to claim 19. See rejection of claim 19 for further explanation.

12. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Choel et al. (”Trabecular alveolar bone in the human mandible: A dual energy x-ray absorptiometry study") in view of Kim (US 6,078,686), and further in view of Inoue (US 2001/0021269).

a. Regarding claim 15, the combination of Choel and Kim, as applied in claim 12, discloses all the previous claim limitation including wherein said evaluating means (Choel; Table III; Chapter- Material and Methods: Ex vivo materials and Chatper-BMD differences related to sex, dental status, and anatomic location, pages 365 and 367, “The author discloses using a multiple regression analysis based on the mean bone mineral density (BMD) and SDs for G, R1 and R2, which are the global specimen, infra-alveolar ROI and real intra-alveolar ROI, respectively, to assess the sex and dental status.”).

However, the combination of Choel and Kim does not disclose display means for displaying said corrected gradation in the form of histogram.

Instead of Choel and Kim, Inoue, the same field of endeavor of image processing, discloses display means (Fig. 3-310; “display” at ¶ 0118) for displaying said corrected gradation in the form of histogram (Fig. 3-307; “The author discloses that a histogram, which is created after gradation conversion has passed through the memory, is displayed on the display as the histogram" at ¶ 0118).

Choel, Kim and Inoue are combinable because they are all related to the field of image processing.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the step of “[t]he created histogram [being] displayed on the display 310 as the histogram 307” (Inoue; Figs. 3-307 and 3-310; ¶ 0118) in the step of the “multiple regression analysis … [which] sex and dental status [being] assessed' (Choel; Table III; Chapter- Material and Methods: Ex vivo materials and Chatper-BMD differences related to sex, dental status, and anatomic location, pages 365 and 367) of the combination of Choel and Kim.

The suggestion/motivation for doing so would have been to provide "[t]he created histogram [being] displayed on the display at the histogram" (Inoue; ¶ 0118) because “an observer can observe most easily" (Inoue; ¶ 0067) "a histogram of an image ... while gradationally converting one or a plurality of images interactively" (Inoue; ¶ 0067).

Therefore, it would have been obvious to combine Choel, Kim and Inoue to obtain the invention as specified in claim 15.

Conclusion

13. The prior art made of record is considered pertinent to the disclosure of the application:

- Guillemaud (US 6,296,387 B1): The invention related to a method for correcting image defects from a matrix-type X or γ-ray detector, consisting in producing a confidence map.
- Lang et al. (US 2003/0112921 A1): The invention relates to a method and devices for analyzing x-ray images. In particular, devices , methods and

algorithms are provided that allow for the accurate and reliable evaluation of bone structure from x-ray images.

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN Wahnkyo LEE whose telephone number is (571)272-9554. The examiner can normally be reached on Monday - Friday (Alt.) 7:30 a.m. - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Samir Ahmed can be reached on (571) 272-7413. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John Wahnkyo Lee/
Examiner, Art Unit 2624

/Samir A. Ahmed/
Supervisory Patent Examiner, Art Unit 2624